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Research paper

Ethnobotanical survey of medicinal plants used by people in Oriental Morocco to manage various ailments

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ABSTRACT

Ethnopharmacological relevance: This document presents the uses of plants in traditional herbal medicines in Oriental Morocco. It also determines the homogeneity of informant knowledge in medicinal plants suitable for different ailment categories and the most preferred plant species used to treat each illness category in the study area.

Materials and methods: The ethnobotanical information was obtained from 3151 inhabitants who were 20 years and older in five different areas of Oriental Morocco region. The data were analyzed through informant consensus factor (ICF) and frequency of uses (FC).

Results: The results indicated that 65.7% of the participants interviewed used medicinal plants to treat 23 ailments. The inventory of medicinal plants is summarized in a synoptic table, which contains the scientific and vernacular names of the plant, the part of the plant and the preparation used and the therapeutic indication. Extensive investigations have brought to light 148 medicinal plants belonging to 60 families; of these, 108 are used for the disorders of the digestive system, 74 for diabetes, 73 for dermatological problems, 66 for allergy, 66 for cardiovascular disorders and 63 for respiratory problems. In this region, the most frequently used plants including *Origanum compactum* Benth., *Trigonella foenum graecum* L., *Lavandula dentata* L., *Mentha pulegium* L., *Nigella sativa* L., *Rosmarinus officinalis* L., *Lippia citriodora* L., *Tetraclinis articulata* Benth., and *Atemisia herba-alba* Asso. Lamiaceae and Asteraceae are the dominant locally used families. Most medicines were prepared in the form of powder and used orally. Leaves were the most frequently used plant part. Gastro-intestinal ailments have high ICF (0.92) whereas pathologies of the circulatory and ophthalmological uses have low ICF (0.22 and 0.24, respectively).

Conclusion: Oriental Morocco boasts an extensive phytotherapy knowledge base and ICF values indicated that there was high agreement in the use of plants in gastro-intestinal ailment category among the users. The frequency use value (FC) indicated that these plants are the most preferred species used in study areas. These preferred plant species could be prioritized for conservation and subjected to further studies related to chemical screening for their authenticity.

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1. Introduction

For a long time plants have played a very important role for human life. Nowadays, the use of plants as a way of treatment is still very important for human beings. Traditional medicinal plants also play an important role in Morocco (Baytop, 1999).

In the last decade, most of the ethnobotanical studies have investigated the traditional knowledge and usage of plants in Morocco (Ziyyat et al., 1997; Bellakhdar, 1997; Hmammouchi, 1999; Merzouki et al., 2000; Jouad et al., 2001; Eddouks et al., 2002; El-Hilaly et al., 2003; Merzouki et al., 2003; Tahraoui et al., 2006). By contrast, ethnobotanical research has been somewhat neglected in the Oriental Region of this country, the only report devoted for this region was consecrated to the specific medicinal plants used for the treatment of diabetes and hypertension (Ziyyat et al., 1997). So, our investigation is the first one which deals with an ethnobotanical study on medicinal plants in this region.

Abbreviations: bu, bulbs; C, cortex; dec, decoction; di, directly; ex, external application; F, fruits; Fl, flowers; H, buy; inf, infusion; inh, inhalation; Ju, juice; L, leafs; mac, maceration; oi, oil; or, orala dministration; po, powder; r, harvest; R, roots; Rh, rhizome; S, seeds; ST, stem; W, whole plant; < 10, less than 10 min; 11/20, between 10 and 20 min; 21/60, between 21 and 60 min; H, hour; J-N, day or hour; FC, frequency; ICF, informant consensus factor; UN, United Nations

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2. Materials and methods

2.1. Study area

Morocco is located between the Mediterranean and the Atlantic "Maghrib alaqça" (Fig. 1), with a surface of 710.850 km^2, constituting a zone of North–South passage. It belongs at the same time to the Mediterranean world and the Sahara world. In addition to the presence of the sea, the Sahara and high mountains give Morocco a diverse climate. We can distinguish three climatic zones: the Atlantic zone, the zone of the mountains and the Eastern zone. The heterogeneous ecological conditions supported the proliferation of more than 42,000 species of plants, divided into 150 families and 940 kinds (Jahandiez and Maire, 1931/1934; Negre, 1961; Ozenda, 1977; Hmammouchi, 1999).

Located in the northeast of Morocco, the Oriental Region shares its southeast region border with Algeria and to the north has 200 km of Mediterranean coastline. It also bordered on the west by the Tazza-Alhoceima region and in the south by the desert.

The area of the region is 82,820 km^2, which is more than a tenth of the total surface area of Morocco (Figs. 1 and 2).The Mediterranean climate in the north of the region becomes more arid and continental to the south. Arabic is the official language of Morocco. The Moroccan Arabic dialect is used primarily in speech. Particularly, we find a large Berber population in the Oriental Region, where the Rifan, the Amazigh Rif dialect is spoken. Aromatic and medicinal plants are an important commercial activity. In the Oriental Region, *Artemisia vulgaris* and Rosmarinus are the species that dominate the aromatic and medicinal plants production and give rise to major commercial transactions. The trade in Rosemary, which could support the development of cosmetic processing units, generates an activity of about 81,000 working days per year, with a corresponding value of (4,05 millions MAD) "equivalent to 500,000 Dollars US". Throughout the cooperative based in Figuig, Taourirt and Jerrada, the region has managed to build on its expertise in this area to develop the sector and make it a real source of wealth for the people, by implementing new farming methods for Rosemary fields and by introducing new species from Asian countries (UN, 2012).

Fig. 1. Map of Morocco.

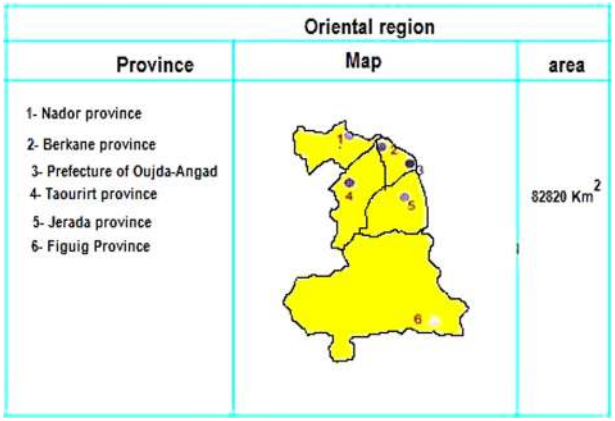

Fig. 2. Map of Oriental Morocco.

2.2. Ethnobotanical survey

Ethnobotanical and éthnomédicinal information was obtained from 3151 inhabitants who were 20 years and older from five different areas of Oriental Morocco region (Fig. 2; Table 1). The prefecture included Oujda-Angad, Nador province, Figuig province and Taourirt province. The collection of information has been done by a group of students, "bachelor graduate", who master the languages of these areas. Participants interviewed were informed about the objectives of the study.

From each participant, the following information was gathered and set on an identity card:

- name, their age, sex, cultural level, occupation.
- date and place where information was gathered.
- pathology of persons interviewed and frequency of medical visits.
- name of the plant: botanical name and vernacular name.
- ecological distribution: local or imported, cultivated species or spontaneous.
- parts used: leaves, fruit, aerial parts, roots, seeds.
- the source of their medicinal plant.
- the reasons for using specific medicinal plants.
- the results of phytotherapy (good, average or variable).
- the precision of doses.
- the knowledge of toxic plants.
- the mode of preparation, its use and the duration of this use.
- finally the participants were questioned on any observed effects of the plants used.

The questionnaire was addressed to people who knew and employed the plants for medicinal use. Based on the information collected, plants that were mentioned two times or more were selected for further investigation. Vouchers specimens in the form of dried plants, parts of plants or even photos could be found

Table 1
The different regions the survey has realized.

Number	District	Villages and districts
1	Province of Oujda Angad and Berkane	Bni-drar, Oujda city (Lazaret, Toba, Mdina Kdima, Oued Nachef, Sidi Yahya,Tennis, Qods, kolouch,…), Berkane city, Tafoughal, Elayoun, Ahfir.
2	Nador province	Nador city, Farkharna, Zayou, Salouane, Jaadar, Elaaroui, ben tayeb, Kabdana, Taouima, Tamsaman, Arkman, Zghanghan, Midar.
3	Figuig province	Figuig city, Bouaarfa city, Znaga, Barhdad.

deposited at the plant section of Herbarium University Mohammed Premier Oujda Morocco (HUMPO). The identity of each plant species or part used mentioned by the interviewees was verified and confirmed by a professional botanist, Professor Fennane Mohammed from Scientific Institute in Rabat, Morocco.

2.3. Statistical analysis

Informant consensus factor (Trotter and Logan, 1986; Heinrich et al., 1998) was calculated using the following formula: ICF = Nur − Nt/Nur − 1, where Nur is the number of use citations in each ailment and Nt is the number of species used for this ailment. The ICF provides a range of 0–1, where high values (close to 1) are obtained when only one or a few plant species are reported to be used by a high proportion of informants to treat a particular ailment. High ICF thus means that there is a narrow well-defined group of species used to cure a particular ailment category and/or that information is exchanged between informants. On the other hand, low ICF values (close to zero) indicate that informants disagree over which plant to use due to random choosing or lack of exchange of information about use among informants (Gazzaneo et al., 2005). The frequency (FC) "statistica (1993), Software edited by StatSoft, Inc, Society 1993" was used for determining the most used plants and therefore the most preferred plants.

3. Results and discussion

3.1. Percentage of uses of medicinal plants for phytotherapy

The survey reached more than 3245 people in the Oriental Moroccan region and 3151 participants responded, of which 71.2% were from the provinces of Oujda-Berkane, 18% from Nador and 10.8% from Figuig (Table 2). Percentage usage of medicinal plants was 65.7% (2029) within the study population. In previous studies, many authors reported that the percentage of uses of medicinal plants oscillated between 55% and 95% according to the area where the survey was undertaken. The rate of use of the medicinal plants changes according to area, ethnology, richness of the sector in medicinal plants and home environment (Sekkat, 1987; Nabih, 1992; Jouad, 1992; Bellakhdar, 1997; Ziyyat et al., 1997; Hmammouchi, 1999; Eddouks et al., 2002). The data from these studies clearly show that phytotherapy is practiced in Oriental Morocco as in other regions.

3.2. Use of plants according to the geographical areas

Use of medicinal plants is higher in the areas of the Figuig province (86.3%) compared to Oujda-Berkane (62.9%) and Nador (64.4%) provinces (Table 2).

3.3. Use of plants according to gender

Women (71.3%) used medicinal plants more frequently than men (59.2%) (Table 2). The results of other surveys reported similar findings in many regions of Morocco and have showed that generally women (61–65%) used medicinal plants more than men (35–39%) (Hamdani, 1984; El Beghdadi, 1991; Jouad, 1992; Nabih, 1992; Ziyyat et al., 1997). This could be explained by the following factors:

- Women are more attached to traditional practices than men (Jouad et al., 2001).
- The ease of transmission of this information among women. This may explain their relative knowledge of medicinal plants uses in this area (Hamdani, 1984; Jouad, 1992; Nabih, 1992).

Table 2
Socio-demographic characteristics of participants (3151).

Characteristic	*Sample*		*Use herbal médicine*	
	Number	Percentage (%)	Number	Percentage (%)
District				
Oujda-Berkane:	2245	71.20	1382	62.90
Nador	567	18.00	363	64.40
Figuig	339	10.80	283	86.30
Total:	3151	100.00	2028	65.70
Age				
20–30 years	961	30.50	631	66.30
30–60 years	1594	50.60	1046	66.70
More than 60	596	18.90	352	59.90
Total:	3151	100.00	2029	65.70
Sex				
Female	1691	53.70	1181	71.30
Male	1460	46.30	848	59.20
Total:	3151	100.00	2029	65.70
Residence				
Urban	2485	82.00	1507	61.70
Rural	547	18.00	442	83.10
Total:	3032	100.00	1948	65.50
Family situation				
Married	2041	65.50	1310	65.9
Single	1036	33.30	653	64.30
Divorce	37	1.20	27	74
Total:	3114	100.00	2000	65.50
Education				
No	990	32.30	648	66.80
Primary	709	23.10	454	65.40
Secondary	749	24.40	466	63.50
university	619	20.20	390	64.30
Total:	3067	100.00	1958	65.20
Activity				
No	1665	58.00	1101	67.50
Active	1207	42.00	739	62.40
Total:	2872	100.00	1840	65.40
Socio-economic situation				
High	331	10.70	205	62.90
Intermediate	1996	64.30	1269	64.80
Low	779	25.10	526	69.20
Total:	3106	100.00	2000	65.70

- Most women are well-versed in traditional knowledge (Hamdani, 1984; Jouad, 1992; Nabih, 1992), and they are more often at home during the hours of the survey (Jouad et al., 2001). As an added incentive, being knowledgeable in the art of healing with plants adds to the status of women, who are primarily involved in domestic lifestyles (Tahraoui et al., 2006).

3.4. Use of plants according to residence

Among the 2485 people interviewed in the urban environment, 2441 answered the questions, of which 61.7% used medicinal plants; among the 547 in the rural environments, 532 answered the questions, of which 83.1% use medicinal plants (Table 2). These data indicate that rural participants are the principal consumers of (83.1%) medicinal plants owing to the fact that the rural suppliers kept good contact with the nature, which still gets to them many resources (Bellakhdar, 1997).

3.5. Reasons of the use of medicinal plants

The participants reported several reasons for the use of medicinal plants – 52.7% (567 participants stated phytotherapy is

Table 3
List of medicinal plants used in Oriental Morocco recorded in our ethnobotanical survey.

Family	Scientific name	Voucher	Local name	Part used	Préparation used	Duration	Mode of administration	Adding	Frequency of uses	Diseases	Corresponding references
Anacardiaceae	*Pistacia atlantica* Desf.	HUMPOM1	البطمة	C (2)	dec (2)	< 10 (2)	or (2)	food (1)	(2)	alrg (1) pdig (1) Pren (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
	Pistacia lentiscus L.	HUMPOM2	الضرو - فاضيس	L (5) W (3) OTHER (4)	dec (5) inf (3) OTHER (4)	11/20 (3) < 10 (2)	or (11) inh (1)	food (1) dattes (1)	(14)	pdig (5) dia (3) pcard (2)	Bellakhdar et al., 1991 ; El-Hilaly et al., 2003.
	Rhus tripartitum DC.	HUMPOM3	تيزغا - تيزغت	R (1) C (1)	dec (2)	21/60 (1) < 10 (1)	or (2)		(2)	pcard (1) pdig (1)	
Apiaceae	*Ammodaucus leucotrichus* coss et Dur.	HUMPOM4	الكمون الصوفي	S (8)	dec (3) inf (3) po (1)	< 10 (3) 11/20 (2)	or (6) inh (1)		(8)	pdig (3) pali (1) prep (1)	Bellakhdar et al., 1991; Jouad et al., 2001.
	Apium graveolens L.	HUMPOM5	لكرافس	W (4) L (4)	dec (5) inf (3)	21/60 (3) 11/20 (2) < 10 (1)	or (10)	honey (1)	(10)	Pren (4) pcard (2) pdig (2)	Bellakhdar et al., 1991; Jouad et al. 2001; El-Hilaly et al., 2003.
	Carum carvi L.	HUMPOM6	الكروية	S (11)	dec (5) po (5) inf (1)	11/20 (1) 1H (1) < 10 (1)	or (11)	honey (2)	(11)	pdig (10) dia (1) psn (1)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Coriandrum sativum L.	HUMPOM7	القصبر	S (7) W (3)	po (4) inf (3) dec (2)	21/60 (1) < 10 (1)	or (9) inh (1)	food (1) drink (1) alum (1)	(10)	pdig (3) Pren (3) alrg (2)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Cyminum Cuminum L.	HUMPOM8	الكمون	S (76) L (3) F (1)	po (55) dec (17) inf (10)	< 10 (12) 11/20 (3) 1H (1)	or (77) ex (5)	honey (5) food (3) oil (2)	(84)	pdig (47) presp (8) psn (4)	Bellakhdar et al., 1991; Jouad et al., 2001.
	Daucus carota L.	HUMPOM9	زرودية - خيزو	RH (2)	ju (2)		or (2)		(2)	pdig (2)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003.
	Daucus crinitus Desf.	HUMPOM10	بوزفور	R (6) ST (4) W (1)	po (8) dec (3)	1H (1) 2H (1) < 10 (1)	or (12) inh (2) ex (1)	food (6) honey (1)	(14)	pdig (4) pali (3) pcard (3)	Bellakhdar et al., 1991.
	Ferula communis L.	HUMPOM11	الفاسوخ		dec (2)	1J-N (1)	inh (1) or (1)		(2)		
	Foeniculum vulgare P.Mill.	HUMPOM12	النافع	S (44) W (4)	inf (16) dec (15) po (15)	< 10 (9) 11/20 (4) 1H (1)	or (46) ex (3)	honey (7) food (1) sugar (1)	(49)	pdig (32) pcard (4) dia (3)	Bellakhdar et al., 1991; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Petroselinum sativum Hoffm.	HUMPOM13	المعدنوس	L (7) W (6) S (3)	dec (6) inf (4) mac (3)	11/20 (2) 21/60 (2) < 10 (2)	or (17)	drink (1)	(17)	pcard (6) Pren (5) alrg (1)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; Tahraoui et al., 2006.
	Pimpinella anisum L.	HUMPOM14	حبة حلاوة	S (35) L (2) F (1)	dec (16) po (11) inf (10)	11/20 (7) < 10 (6) 21/60 (3)	or (38)	honey (3) drink (1) flower water (1)	(39)	pdig (21) pcard (7) presp (4)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Polygonum maritimum	HUMPOM15	الزياتة	W (3) R (2) C (1)	dec (3) po (2)	21/60 (2) < 10 (1)	or (4) inh (1) ex (1)	food (1)	(6)	pdig (3) alrg (1) chol (1)	
Apocynaceae	*Nerium oleanda* L.	HUMPOM16	الدفلة - أليلي - أريري	L (16) W (5) ST (5)	dec (15) dec (9) inf (3)	21/60 (5) 11/20 (3) < 10 (3)	inh (20) ex (12) or (2)	grease (1)	(35)	dia (7) pden (4) Pmusq (4)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Ptychotis verticillata L.	HUMPOM17	النونخة	W (41) L (36) R (2)	dec (52) inf (37) po (5)	< 10 (27) 11/20 (13) 21/60 (6)	or (73) inh (16) ex (8)	food (6) honey (4) drink (2)	(92)	pfroi (20) pdig (17) presp (11)	Ziyyat et al., 1997.
Aristolochiaceae	*Aristolochia longa* L.	HUMPOM18	برزطم	RH (12)	po (11)	11/20 (1) < 10 (1)	or (10) ex (2)	honey (10) drink (1)	(12)	cancer (5) dia (3) pdig (3)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
Asparagaceae	*Asparagus Albus* L.	HUMPOM19	السكوم	R (1)	dec (1)		or (2)		(2)	dia (1) pcir (1)	Bellakhdar et al., 1991.
Asphodelaceae	*Asphodelus microcarpus* Salzm.& Viv.	HUMPOM20	البرواك	R (2) ST (1)	dec (3)	< 10 (2) 11/20 (1)	or (2) ex (1)	oil (1)	(3)	pdig (1) Porl (1)	Bellakhdar et al., 1991.
Asteraceae/ compositae	*Artemisia absinctium* L.	HUMPOM21	الشهيبة	L (12) W (1)	dec (8) inf (3) mac (1)	11/20 (1) 1H (1) < 10 (1)	ex (8) or (6)	oil (3) drink (1) alum (1)	(14)	Porl (4) dia (2) pden (2)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Artemisia campestris L.	HUMPOM22	ألال	S (6) L (4) W (2)	dec (11) po (3) inf (1)	< 10 (4) 11/20 (2) 2H (1)	or (13)	food (2) honey (2) drink (1)	(19)	pdig (5) alrg (2) presp (2)	
	Atemisia herba-alba Asso.	HUMPOM23	الشيح - ازري	L (94) W (30) FL (6)	dec (106) inf (30) po (10)	< 10 (49) 11/20 (25) 21/60 (8)	or (134) ex (9) inh (6)	food (3) honey (3) drink (1)	(157)	pdig (53) dia (30) pdermo (14)	Bellakhdar et al., 1991; Jouad et al., 2001; Tahraoui et al., 2006.
	Cynara cardunculus L.	HUMPOM24	الخرشف	L (1) OTHER(1)	dec (1) inf (1)	21/60 (1) < 10 (1)	or (2)		(2)	pdig (2) dia (1)	Bellakhdar et al., 1991; Jouad et al., 2001; Tahraoui et al., 2006.
	Cynara scolymus L.	HUMPOM25	القرنيع - نياس	FL (2) W (1) OTHER (2)	dec (4) inf (3)	11/20 (3) 21/60 (1)	or (6) ex (1)	alum (1) honey (1)	(7)	pdig (4) chol (1) pden (1)	

Table 3 (*continued*)

Family	Scientific name	Voucher	Local name	Part used	Préparation used	Duration	Mode of administration	Adding	Frequency of uses	Diseases	Corresponding references
	Helianthus annuus L.	HUMPOM26	عباد الشمس	F (1)	dec (1)		or (1)		(2)	chol (1) pcir (1)	Jouad et al., 2001.
	Inula viscosa L.	HUMPOM27	مكرمان – ميرمان	L (7) W (4) S (1)	dec (5) inf (3) po (2)	21/60 (2) < 10 (2) 11/20 (1)	or (7) ex (5)	honey (1)	(12)	pdig (4) dia (1) pcard (1)	Bellakhdar et al., 1991; Ziyyat et al., 1997.
	Launea arborescens	HUMPOM28	ملبينة	W (2)	dec (2)	2H (1) 3H (1)	or (2)		(2)	dia (1) fiev (1)	
	Warionia saharae Benth & Coss.	HUMPOM29	أفسأس	L (4) W (1) FL (1)	dec (5) inf (1)	< 10 (5) 4H (1)	or (7) ex (2)	honey (1)	(10)	pdig (4) alrg (2) pdermo (2)	Bellakhdar et al., 1991.
	Anacyclus Pyrethrum L.	HUMPOM30	تكنطيست	L (3) W (2) R (1)	po (4)		or (5)	food (1)	(5)	pdig (2) alrg (1) dia (1)	Bellakhdar et al., 1991.
	Anvillea radiata coss & Dur	HUMPOM31	النكد	R (3) W (1)	dec (4)	11/20 (2) 21/60 (1) < 10 (1)	or (3) inh (2)		(5)	pdig (2) dia (1) pdermo (1)	Bellakhdar et al., 1991.
	Brocchia cinera (Del.)	HUMPOM32	الكرطوفة	L (5) FL (2)	dec (6) po (1)	< 10 (4) 11/20 (1)	or (5) ex (2)		(7)	dia (3) pdig (2) pden (1)	Bellakhdar et al., 1991.
	Atractylis gummifera L	HUMPOM33	أداد	R (1) ST (1)	dec (1) mac (1)		inh (1) ex (1)	alum (1)	(2)	alrg (1) pdig (1)	Bellakhdar et al., 1991; Jouad et al., 2001.
	Matricaria chamomilla L.	HUMPOM34	البابونج - مانسنية	FL (30) L (10)	inf (21) dec (17) po (6)	< 10 (22) 11/20 (6)	or (37) ex (9)	drink (1) honey (1)	(46)	pdig (16) pdermo (5) pfroi (4)	
Berberidaceae	*Berberis hispanica* Boiss.et Reut.	HUMPOM35	أغريس	C (8) W (2) R (2)	po (14) dec (2) inf (1)	11/20 (1) 21/60 (1) < 10 (1)	or (17) ex (2)	honey (10) vinegar (1)	(18)	cancer (7) pdig (5) dia (4)	
Boraginaceae	*Borago officinalis* L.	HUMPOM36	الحريشة الهندية	L (2) W (1)	po (2) ju (1)		ex (3)	oil (2)	(3)	presp (2) Pmusq (1)	El-Hilaly et al., 2003.
Cactaceae	*Opuntia ficus -indica* (L) Mil.	HUMPOM37		FL (7) L (3) R (1)	dec (6) inf (3) mac (1)	< 10 (3) 1H (1) 21/60 (1)	or (9) ex (4)	food (1) honey (1) grease (1)	(12)	pdig (5) pdermo (2) alrg (1)	Bellakhdar et al., 1991; Jouad et al., 2001; Tahraoui et al., 2006.
Camélliaceae	*Camellia thea* Link.	HUMPOM38	أتاي	L (15)	inf (6) po (6) dec (3)	< 10 (4) 11/20 (1) 21/60 (1)	or (10) ex (5)	drink (1) SALT (1) grease (1)	(16)	pdig (7) pdermo (2) pcard (1)	
Cannabaceae	*Cannabis sativa* L.	HUMPOM39	لحشيش - الكيف	FL (4) L (2)	bur (2) dec (1) mac (1)	3H (1)	inh (2) ex (2)		(4)	pdermo (2) psn (2)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003.
Caparidaceae	*Cappariss spinosa* L.	HUMPOM40	الكبار – تايلالوت	S (3)	po (3)		or (3)		(3)	dia (3)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
Caryophyllaceae	*Corrigiola telephiifolia* Pour.	HUMPOM41	سرغينة	W (1) R (1)	po (2) dec (1)	21/60 (1) < 10 (1)	or (2) ex (1)	food (1) honey (1)	(4)	pdig (2) Pmusq (1) prep (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
	Hernaria hirsuta L	HUMPOM42	هراسة لحجر - فتاتة لحجر - الضعيفة	L (15) W (12)	dec (14) inf (11) po (2)	< 10 (10) 11/20 (9) 21/60 (2)	or (28) inh (2) ex (1)	honey (1)	(30)	Pren (21) dia (2) pdermo (1)	Bellakhdar et al., 1991; Jouad et al., 2001.
Chénopodiaceae	*Anabasis aretioides* coss, et Dur	HUMPOM43	الدكع	W (1) L (1)	dec (2)	< 10 (2) 11/20 (1)	inh (1) or (1)	drink (1) honey (1)	(3)	intox (1) pcir (1)	
	Chenopodium ambrosioides L	HUMPOM44	مخينزة	L (32) W (13)	dec (17) inf (7) mac (7)	< 10 (13) 11/20 (3) 21/60 (1)	ex (29) or (20)	flower water (4) food (1) drink (1)	(49)	Ptete (15) fiev (6) pdig (5)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al. 2006.
	Haloxylon scoparium Pomp.	HUMPOM45	الرمت – أساي	L (9) W (2) bu (2)	dec (6) po (4) ju (2)	< 10 (7) 11/20 (2)	or (11) ex (3) inh (1)	honey (1) grease (1) dattes (1)	(15)	intox (5) pdig (4) alrg (2)	
Cruciferae/ Brassicaceae	*Brassica napus* L.	HUMPOM46	اللفت	RH (4) L (3)	dec (5) mac (1)	< 10 (1)	or (4) ex (3)	drink (1) vinegar (1)	(7)	Pmicro (4) Pmusq (1)	
	Brassica oleracea L.	HUMPOM47	الكرم	L (2)	dec (2)		ex (2)		(2)	fiev (1) Pmusq (1)	Jouad et al., 2001; El-Hilaly et al., 2003.
	Lepidium sativum L.	HUMPOM48	حب الرشاد – الحرف	S (18)	po (10) dec (3) inf (1)	< 10 (1)	or (17) ex (1)	drink (8) honey (4) eggs (1)	(18)	pdig (5) pcard (3) presp (3)	Bellakhdar et al., 1991; Jouad et al., 2001; Tahraoui et al., 2006.

Cucurbitaceae	*Citrullus colocynthis* L.	HUMPOM49	الحدجة – الحنضل	F (13)	dec (8) po (3)	< 10 (2) 11/20 (1) 1H (1)	or (8) ex (7)	food (1) oil (1)	(14)	dia (10) pcir (2) chol (1)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; Tahraoui et al., 2006.
	Cucurbita pepo L.	HUMPOM50	الكرعة الحمرا	F (1) L (1)	po (1) ju (1)	< 10 (1)	or (1)	drink (1) honey (1)	(2)	pcard (1) pfroi (1)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003.
	Lagenaria siceraria Standl.	HUMPOM51	الكرعة السلاوية	C (3)	Dec (2)		inh (3)		(3)	Ptete (3)	El-Hilaly et al., 2003.
Cupréssaceae	*Tetraclinis articulata* Benth.	HUMPOM52	العرعار	L (91) W (25) F (5)	dec (70) po (37) inf (29)	< 10 (29) 11/20 (20) 21/60 (9)	or (117) ex (21) inh (10)	drink (10) honey (9) alum (1)	(158)	pdig (60) alrg (13) pdermo (12)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003.
Ericaceae	*Arbutus unedo* L.	HUMPOM53	ساسنو	R (5) C (1)	dec (6)	< 10 (2) 11/20 (1) 1H (1)	or (5) inh (1)	eggs (1)	(6)	pcard (4) chol (1) pdig (1)	Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003.
Euphorbiaceae	*Euphorbia resinifera* Berg.	HUMPOM54	تكيوت – تكاوت	W (1) C (1)	inf (1) po (1)	1J-N (1)	ex (2)		(2)	intox (1) Ptete (1)	Bellakhdar et al., 1991.
	Euphorbia saharae Benth & Coss.	HUMPOM55	الرمادة	C (1) L (1)	dec (1) po (1)	< 10 (1)	or (2)		(2)	pdig (2)	
	Rucinus communis L.	HUMPOM56	الخروع	L (5)	dec (3) oi (3) 7 (1)		ex (6) inh (1)		(7)	fiev (3) pdermo (1) Pmusq (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
Fabaceae/ Leguminoseae	*Cassia Senna* L.	HUMPOM57	السنا	L (42) W (2)	dec (23) inf (18) po (5)	< 10 (15) 11/20 (7) 21/60 (2)	or (47) ex (1)	honey (6) food (1) Rd (1)	(51)	pdig (38) Pmusq (2) dia (1)	Bellakhdar et al., 1991.
	Cicer arietanum L.	HUMPOM58	الحمص	S (3)	po (2) mac (1)		or (2) ex (1)	honey (2) food (1) vinegar (1)	(3)	pdig (2) pdermo (1)	Bellakhdar et al., 1991.
	Glycyrrhiza glabra L..	HUMPOM59	عرق السوس	ST (16) S (1)	dec (8) inf (4) po (4)	< 10 (4) 21/60 (2) 11/20 (1)	or (16)	honey (4)	(17)	pdig (7) presp (6) alrg (3)	Bellakhdar et al., 1991; Jouad et al., 2001.
	Hispida maxim.	HUMPOM60	الصوجا	S (8)	po (7)		or (8)	honey (3) drink (1)	(8)	pdig (3) pdermo (2) alrg (1)	Jouad et al., 2001.
	Lens culinaris Med.	HUMPOM61	لعدس	S (2)	po (2)		or (2)	honey (1)	(2)	pdig (1)	
	Lupinus albus L.	HUMPOM62	الترمس	S (3)	po (3)		or (3)		(3)	dia (2) pcard (1) pdig (1)	Jouad et al., 2001.
	Trigonella foenum graecum L.	HUMPOM63	الحلبة	S (200) F (4) W (2)	po (101) inf (49) dec (37)	11/20 (19) < 10 (18) 1J-N (13)	or (194) ex (8) inh (3)	honey (40) drink (6) food (5)	(212)	pdig (66) dia (54) presp (17)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001.
	Vicia ervilia (L.) Willd.	HUMPOM64	كرسنة	S (4)	po (3) mac (1)		or (4)	honey (1)	(4)	pdig (2) alrg (1) pali (1)	
	Vicia faba L.	HUMPOM65	الفول	S (11) L (1)	po (8) dec (2) inf (1)	< 10 (3)	or (12)	drink (3) honey (3) grease (2)	(12)	presp (4) alrg (3) dia (2)	
Fagaceae	*Querqus faginea* Lamk.	HUMPOM66	العصفة		dec (1) po (1)	11/20 (1)	ex (2)	alum (1) honey (1)	(2)	pden (1) pdermo (1)	Bellakhdar et al., 1991.
	Querqus suber L.	HUMPOM67	دباغ - البلوط - تزاخت	C (21)	dec (13) po (7) inf (1)	< 10 (5) 11/20 (2) 21/60 (2)	or (17) ex (4)	drink (1) alum (1)	(21)	pdig (15) pden (2) pdermo (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
Gentianaceae	*Centaurium erythraea* Rafn.	HUMPOM68	مرارة لحنش - كسة الحية	W (1)	dec (2)	11/20 (1)	or (2)		(2)	dia (1) pali (1)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003.
Globulariaceae	*Globularia alypum* L.	HUMPOM69	عين لرنب	L (8) W (2)	dec (6) inf (2) po (1)	< 10 (3) 21/60 (2) 11/20 (1)	or (8) inh (1) ex (1)	alum (1) honey (1)	(10)	pdig (6) dia (2) alrg (1)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001.
Iridaceae	*Crocus sativus* L.	HUMPOM70	الزعفران الحر	FL (12)	po (6) inf (3) mac (1)	11/20 (1) 1H (1) < 10 (1)	or (6) ex (4) inh (2)	honey (2) sulfur (2) food (1)	(12)	Pmicro (3) presp (2) Ptete (2)	Bellakhdar et al., 1991; Jouad et al., 2001.
Juglandaceae	*Juglans regia* L.	HUMPOM71	السواك - الكركاع	C (14) S (1) L (1)	dec (5) inf (4) po (4)	< 10 (7) 11/20 (1) 21/60 (1)	ex (11) or (5)	alum (2) food (1) honey (1)	(16)	pden (4) pdermo (2) pdig (2)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al. 2001; El-Hilaly et al., 2003.
Juncaceae	*Juncus acutus* L.	HUMPOM72	الصمار	R (4) W (1)	dec (4) inf (1)	11/20 (2) 1H (1) 2H (1)	or (4) inh (1)		(5)	pcir (1) pdig (1) Pren (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
Lamiaceae	*Teucrium polium* L.	HUMPOM73	الجعدة	FL (2)	dec (1) inf (1)	11/20 (1) < 10 (1)	or (2)		(2)	pdig (2)	Bellakhdar et al., 1991.

Table 3 (*continued*)

Family	Scientific name	Voucher	Local name	Part used	Préparation used	Duration	Mode of administration	Adding	Frequency of uses	Diseases	Corresponding references
	Ceratonia siliqua L	HUMPOM74	الخروب	F (12) C (1)	po (13)	< 10 (1)	or (12) ex (1)	honey (8) yoghurt (1)	(13)	pdig (11) pdermo (1) presp (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
	Ajuga iva L.	HUMPOM75	شندكورة	L (11) W (6) R (2)	dec (17) inf (2) po (1)	< 10 (3) 11/20 (2) 21/60 (2)	or (19) inh (3) ex (2)	honey (1)	(27)	pcard (6) pdig (5) presp (5)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Lavandula dentata L.	HUMPOM76	لخزامى	L (97) FL (50) W (18)	dec (99) inf (78) po (17)	< 10 (73) 11/20 (34) 21/60 (10)	or (171) ex (22) inh (9)	honey (6) alum (1) flower water (1)	(198)	pdig (73) prep (25) pfroi (13)	Ziyyat et al., 1997; Jouad et al., 2001.
	Lavandula stoechas L.	HUMPOM77	الحلحال	L (3) W (2)	po (3) dec (1) inf (1)	11/20 (1)	or (4) ex (1)	honey (2)	(5)	pdig (2) chol (1) dia (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Mentha pulegium L.	HUMPOM78	فليو	L (112) W (29) FL (5)	dec (112) inf (55) po (7)	< 10 (59) 11/20 (40) 21/60 (11)	or (161) inh (22) ex (3)	drink (10) food (5) honey (3)	(181)	pdig (48) pfroi (33) presp (22)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001, El-Hilaly et al., 2003, Tahraoui et al., 2006.
	Mentha suaveolens Ehr .	HUMPOM79	تمرصاد	L (26) W (3)	dec (22) inf (4) mac (1)	< 10 (18) 11/20 (4) 21/60 (2)	or (27) ex (3) inh (2)	food (2) honey (1)	(32)	pdig (17) alrg (5) dia (3)	Bellakhdar et al., 1991.
	Mentha viridis L.	HUMPOM80	النعناع	L (11) W (6) FL (3)	dec (9) inf (6) oi (2)	< 10 (4) 21/60 (3) 11/20 (2)	or (14) ex (4) inh (2)	food (1) drink (1) flower water (1)	(21)	Pren (3) presp (3) pdermo (2)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Ocinum basillicum L.	HUMPOM81	لحبق	S (1) L (1)	inf (1) po (1)		or (2)	food (1)	(2)	alrg (1) pcard (1) Pren (1)	Bellakhdar et al., 1991; Jouad et al., 2001.
	Origanum compactum Benth.	HUMPOM82	الزعتر	L (428) W (90) S (7)	dec (320) inf (267) po (29)	< 10 (219) 11/20 (98) 21/60 (28)	or (580) inh (37) ex (15)	honey (20) drink (13) food (12)	(633)	pdig (236) pfroi (70) dia (48)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001.
	Origanum majorana L.	HUMPOM83	مرددوش	L (7)	dec (6) inf (2)	< 10 (7) 11/20 (1)	or (8)	drink (1)	(8)	pdig (3) cancer (1) pcard (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Rosmarinus officinalis L.	HUMPOM84	أزير	L (113) W (21) R (2)	dec (87) inf (54) po (11)	< 10 (58) 11/20 (40) 21/60 (7)	or (140) ex (14) inh (8)	drink (4) food (3) honey (3)	(166)	pdig (75) alrg (11) pdermo (11)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Salvia divers (S.tingitana Ettling S.phlomoides Asso…)	HUMPOM85	ميرو - مارو	L (6) W (3)	dec (5) mac (1) dec (1)	11/20 (2) 1H (2) < 10 (1)	ex (4) inh (3) or (3)	grease (1)	(9)	pdermo (4) pcard (3) presp (3)	
	Salvia officinalis	HUMPOM86	السالمية	L (34) FL (1)	inf (22) dec (14) po (1)	< 10 (12) 11/20 (9) 1H (2)	or (38)	drink (6) honey (2)	(39)	dia (13) pcard (6) pdig (5)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Satureja calamintha L.	HUMPOM87	النابطة - المانتة	L (36) W (6)	dec (27) inf (18) po (4)	< 10 (17) 11/20 (5) 1H (1)	or (46) ex (2) inh (1)	food (2) drink (1) honey (1)	(51)	pdig (21) presp (10) pfroi (5)	Jouad et al., 2001; El-Hilaly et al., 2003.
	Thymus ssp.	HUMPOM88	زعيترة - أجوكني	L (13) FL (2) W (1)	dec (9) inf (5)	< 10 (9) 11/20 (5) 1J-N (1)	or (15)		(17)	pdig (13) prep (2) alrg (1)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Marrubium vulgare L.	HUMPOM89	مريوة	L (25) W (5) R (1)	dec (20) po (6) inf (3)	< 10 (7) 11/20 (3) 1J-N (1)	ex (17) or (15) inh (2)	oil (2) honey (2) grease (1)	(36)	pdermo (7) pdig (6) presp (6)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
Lauraceae	*Laurus nobilis* L.	HUMPOM90	ورقة سيدنا موسى	L (2)	dec (2)	21/60 (2)	or (2)	food (2)	(2)	Pmusq (2)	Bellakhdar et al., 1991; Ziyyat et al., 1997.
	Cinnamum cassia Blume	HUMPOM91	القرفة	C (23)	po (11) dec (7) inf (3)	11/20 (3) < 10 (2) 1H (1)	or (22) inh (1) ex (1)	oil (2) drink (1) honey (1)	(25)	pdig (5) dia (4) presp (4)	Bellakhdar et al., 1991.
Liliaceae	*Allium sepa* L	HUMPOM92	البصلة	bu (47)	dec (14) ju (10) di (7)	21/60 (5) < 10 (4) 11/20 (1)	or (23) ex (20) inh (2)	drink (2) honey (2) vinegar (2)	(47)	Pren (7) presp (5) Ptete (5)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Allium satium L.	HUMPOM93	الثوم	bu (72)	dec (39) ju (8) mac (6)	< 10 (8) 11/20 (7) 21/60 (3)	or (47) ex (24) inh (3)	oil (8) honey (6) food (4)	(74)	pcard (19) presp (9) pdermo (8)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Aloe socotrina L.	HUMPOM94	الصبار	C (2) L (2)	dec (2) oi (2)	< 10 (1)	ex (3) inh (1)		(4)	pdermo (2) cancer (1) Pren (1)	Jouad et al., 2001.
Linaceae	*Linum usitatissium* L	HUMPOM95	زريعة الكتان	S (14)	po (11) mac (2)		or (14)	honey (6) food (1) drink (1)	(14)	pdig (5) presp (4) alrg (3)	Bellakhdar et al., 1991; Jouad et al., 2001.
Loranthaceae	*Viscum album* L.	HUMPOM96	لنجبار	S (5)	po (3) dec (2)	11/20 (2)	or (5)	drink (2)	(5)	pali (3) pdig (1)	

Lythraceae	*Lawsonia inermis* L.	HUMPOM97	الحنا - الحني	L (61) W (2) C (2)	po (46) dec (10) mac (6)	< 10 (9) 11/20 (4) 1J-N (4)	ex (46) or (22) inh (1)	alum (4) vinegar (4) sulfur (3)	(70)	pdermo (26) pdig (9) Ptete (9)	Bellakhdar et al., 1991.
Malvaceae	*Malva sylvestris* L	HUMPOM98	الخبيز - تبي	L (3)	dec (2) di (1)	< 10 (1)	ex (2) or (1)	oil (1) SAV (1)	(3)	pdermo (2) pali (1)	Bellakhdar et al., 1991.
Molluginaceae	*Telephium imperati* L.	HUMPOM99	الخياطة	W (1) L (1)	dec (1) di (1)		inh (1) ex (1)		(2)	pcard (1) pdermo (1) pdig (1)	Bellakhdar et al., 1991.
Moraceae	*Ficus carica* L.	HUMPOM100	الكرموس البنان	F (6) L (3)	dec (6) di (1)	21/60 (1) < 10 (1)	or (7) ex (2)	dattes (1)	(9)	pdig (4) pcir (2) pcard (1)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003.
Musaceae	Musa sp.	HUMPOM101		R (1) F (1) L (1)	dec (2) mac (1)	11/20 (1) 1H (1)	or (2) ex (1)		(3)	dia (1) pcir (1) pdermo (1)	
Myrtaceae	*Eucalybtus torquata* Luehmann	HUMPOM102	الكاليبتوس	L (18)	dec (16) inf (4)	< 10 (5) 1H (3) 11/20 (2)	inh (15) or (3) ex (3)		(21)	pdermo (4) presp (4) alrg (3)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Eugenia caryophyllata thumb.	HUMPOM103	عود النوار	FL (37) S (2) L (1)	po (16) dec (13) inf (6)	< 10 (8) 21/60 (3) 11/20 (1)	ex (20) or (19) inh (4)	honey (2) sugar (2) alum (1)	(40)	pdig (9) Ptete (8) pdermo (6)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; Tahraoui et al., 2006.
	Myrtus communis L.	HUMPOM104	الريحان	L (11)	dec (6) inf (3) po (1)	< 10 (4) 21/60 (2) 11/20 (1)	or (7) ex (3) inh (1)		(11)	pdig (7) alrg (1) dia (1)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
Oléaceae	*Fraxinus augustifolia* Vahl	HUMPOM105	توزالت	L (2) C (1) FL (1)	dec (2) inf (2)	1H (2) < 10 (2) 11/20 (1)	or (4) ex (1)	oil (1)	(6)	pdig (3) pdermo (1) psn (1)	Ziyyat et al., 1997.
	Olea europaea L.	HUMPOM106	الزيتون - الزبوج	F (46) L (26) S (2)	oi (45) dec (16) inf (6)	11/20 (9) < 10 (6) 21/60 (5)	ex (40) or (33) inh (1)	honey (4) SALT (4) food (2)	(77)	pdermo (18) presp (10) dia (9)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Phillyrea angustifolia L.	HUMPOM107	مليلس	L (8) W (5) R (2)	dec (12) inf (6)	11/20 (7) < 10 (6) 2H (1)	or (16) inh (3)		(19)	Pmicro (9) pdig (6) pali (1)	
Palmaceae	*Phoenix dactylifera* L	HUMPOM108	النخل	F (5) FL (1) L (1)	dec (6)	21/60 (2) < 10 (2)	or (5) ex (2)		(7)	pdig (2) presp (2) pcard (1)	Ziyyat et al., 1997; Tahraoui et al., 2006.
Papavéraceae	*Papaver rhoeas* L.	HUMPOM109	بنعمان	FL (4) L (1)	dec (2) inf (1) mac (1)	11/20 (1) < 10 (1)	or (3) ex (1)	honey (1)	(4)	alrg (1) pdermo (1) Pren (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
Pédaliaceae	*Sesanum indicum* Dc.	HUMPOM110	الجنجلان	S (10) F (1)	po (9) dec (2) inf (1)	1H (1)	or (11) ex (1)	honey (4) drink (3)	(12)	pdig (4) pcard (3) psn (2)	Bellakhdar et al., 1991; Jouad et al., 2001; Tahraoui et al., 2006.
Pinaceae	*Pinus Pinaster* Aiton	HUMPOM111	الصنوبر - التايدة	C (1) L (1)	po (2)		ex (2)		(2)	pdermo (2)	
Poaceae/ graminaceae	*Cynodon dactylon* L.	HUMPOM112	النجم	R (2) W (1) L (1)	dec (3) inf (1)	11/20 (2) 1H (1)	or (3)		(4)	pcard (1) pcir (1) Pren (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Sorghum vulgare L.	HUMPOM113	البشنة	S (2)	po (1)		or (2)	food (1) oil (1)	(2)	alrg (2)	Bellakhdar et al., 1991; Ziyyat et al., 1997.
	Zea mays L	HUMPOM114	الدرة	S (3) OTHER (2)	dec (4) inf (1) po (1)	11/20 (2) 21/60 (1) < 10 (1)	or (5) inh (1)		(6)	Pren (4) alrg (1)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Hordeum vulgare L.	HUMPOM115	الزرع - الشعير	S (9) C (1)	po (5) dec (4)	21/60 (1) 2H (1) 3H (1)	or (10)	food (2)	(10)	dia (2) alrg (1) fiev (1)	Jouad et al., 2001.
	Stipa tenacissima L.	HUMPOM116	الحلفة - أري	W (1) L (1)	dec (1) inf (1) mac (1)	< 10 (2)	or (3)		(3)	dia (1) pdig (1)	
	Triticum aestivum L.	HUMPOM117	القمح	C (11) S (3) L (1)	po (13) dec (1) inf (1)	< 10 (2) 11/20 (1) 1H (1)	or (15)	yoghurt (7) drink (1) honey (1)	(15)	pdig (11) alrg (1) dia (1)	
Punicaceae	*Punica granatum* L.	HUMPOM118	الرمان	C (72)	po (39) dec (20) inf (9)	< 10 (11) 11/20 (6) 21/60 (5)	or (64) ex (6)	honey (14) drink (1) alum (1)	(72)	pdig (50) pdermo (3) dia (2)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
Ranunculaceae	*Nigella sativa* L.	HUMPOM119	السانوج	S (162) F (2) L (2)	po (117) dec (15) inf (14)	< 10 (13) 11/20 (3) 1H (3)	or (146) ex (17) inh (3)	honey (66) drink (13) food (2)	(173)	pdig (70) presp (17) alrg (16)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
Rhamnaceae	*Zizyphus lotus* (L.)	HUMPOM120	السدرة	F (16) R (6) L (2)	dec (14) po (7) inf (2)	11/20 (5) < 10 (4) 1H (2)	or (23) ex (1)	honey (2)	(24)	pdig (12) Pren (8) presp (2)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
Rosaceae	*Eriobotrya japonica* Lindl.	HUMPOM121	لمزاح	L (6) F (1)	dec (6) inf (1)	21/60 (2) < 10 (1)	or (7)		(7)	pdig (5) alrg (1) pcard (1)	Bellakhdar et al., 1991; Ziyyat et al., 1997; El-Hilaly et al., 2003.
	Mallus communis Dc.	HUMPOM122	التفاح	F (2)	OTHER (2)	< 10 (1)	ex (2)	eggs (1)	(2)	pdermo (1)	
	Prunus amygdalus Stokes.	HUMPOM123	اللوز	S (7) F (1)	po (7) oi (1)		or (8) ex (2)	food (2) drink (2) honey (2)	(10)	dia (3) pdermo (2) Ptete (2)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; Tahraoui et al., 2006.

Table 3 (*continued*)

Family	Scientific name	Voucher	Local name	Part used	Préparation used	Duration	Mode of administration	Adding	Frequency of uses	Diseases	Corresponding references
	Prunus armenica L.	HUMPOM124	المشماش	L (4) F (1) S (1)	dec (3) po (1) oi (1)	2H (1)	or (4) ex (2)	food (2)	(6)	pdermo (2) cancer (1)	Bellakhdar et al., 1991.
	Rosa centifolia Mill.	HUMPOM125	الورد	FL (36) L (1) OTHER (1)	dec (12) inf (9) po (7)	< 10 (9) 21/60 (4) 11/20 (3)	or (23) ex (14) inh (1)	drink (1) MUSK (1) honey (1)	(39)	pdig (18) pdermo (7) presp (3)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
Rubiaceae	*Coffea arabica* L.	HUMPOM126	القهوة	F (2)	dec (1) po (1)		or (1) ex (1)		(2)	pcard (1) Ptete (1)	
	Rubia peregrina L.	HUMPOM127	الفوة	bu (6) L (3) S (1)	inf (5) dec (3) po (2)	< 10 (3) 11/20 (2) 21/60 (1)	or (10)	food (2) honey (1)	(11)	pdig (3) pali (2) pfroi (2)	Bellakhdar et al., 1991; Jouad et al., 2001.
Rutaceae	*Citrus saliaefolius* L.	HUMPOM128	وظمي	R (3) W (2) C (1)	po (4) inf (2) dec (1)	21/60 (1)	or (8) ex (1)	drink (1) honey (1)	(9)	pdig (5) Pmusq (2) pcir (1)	
	Citrus aurantium L.	HUMPOM129	الرنج	FL (11) F (5) L (1)	inf (4) oi (2) OTHER (11)	11/20 (1) 21/60 (1)	ex (9) or (8) inh (1)	MUSK (2) honey (2) drink (1)	(19)	Ptete (6) dia (3) alrg (1)	El-Hilaly et al., 2003; Tahraoui et al., 2006.
	Citrus limum Riss.	HUMPOM130	الحامض - الليمون	F (42) L (1) FL (1)	ju (32) dec (6) inf (3)	< 10 (3) 11/20 (2)	or (31) ex (8) inh (1)	honey (14) drink (4) alum (2)	(45)	Porl (7) pfroi (5) Ptete (5)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
	Citrus sinensis (L.) Osbeck	HUMPOM131	لتشين	L (2) F (1)	dec (1) ju (1)	21/60 (1)	or (3)	food (1) honey (1) eggs (1)	(3)	pdig (1) Pmusq (1)	
	Rutta chalepensis L.	HUMPOM132	الفيجل	L (11) W (4)	inf (9) dec (5) po (3)	11/20 (5) 21/60 (2) < 10 (1)	or (11) ex (5) inh (1)	honey (5) drink (1) oil (1)	(17)	pdig (5) alrg (3) presp (2)	Bellakhdar et al., 1991.
Salicaceae	*Populus nigra* L.	HUMPOM133	الصفصاف	L (8) W (1)	dec (6) po (2) inf (1)	11/20 (2) 21/60 (1) < 10 (1)	or (4) inh (3) ex (2)	flower water (2)	(9)	pdig (2) presp (2) Ptete (2)	Bellakhdar et al., 1991; Jouad et al., 2001; El-Hilaly et al., 2003.
	Salix alba L.	HUMPOM134	عود الما	W (1) L (1)	po (1) dec (1)	< 10 (1)	inh (1) ex (1)		(2)	Pmusq (1)	
Solanaceae	*Lycopersicum exulentum* Mill	HUMPOM135	مطيشة	S (2)			or (2)		(2)	pcard (1)	
Thyméleaceae	*Daphne gnidium* L	HUMPOM136	ألزاز	L (7)	po (5) mac (2) dec (1)	21/60 (1)	ex (6) or (1)	food (1)	(7)	pdermo (3) fiev (1) Ptete (1)	Bellakhdar et al., 1991; El-Hilaly et al., 2003.
	Thymelea hirsuta (L) Endl.	HUMPOM137	المتنان	L (1)	dec (2)	< 10 (2)	inh (1) ex (1)	drink (1)	(2)	pden (1) presp (1)	Ziyyat et al., 1997.
Tiliaceae	*Tilia sylvestris*	HUMPOM138	الزيزفون	W (2) F (1)	dec (1) inf (1) mac (1)	< 10 (1)	or (4)		(4)	presp (2) Ptete (2) pfroi (1)	Jouad et al., 2001.
Urticaceae	*Urtica dioica* L.	HUMPOM139	الحريكة - تيزينات	L (4) W (3)	po (4) dec (3) inf (2)	11/20 (1) 1H (1) < 10 (1)	or (7)	honey (1)	(9)	Pren (3) alrg (1) dia (1)	Ziyyat et al., 1997; Jouad et al., 2001; El-Hilaly et al., 2003; Tahraoui et al., 2006.
Valerianaceae	Valeriana divers.	HUMPOM140	السنبل		inf (1) po (1) dec (1)		ex (2) inh (1)		(3)	Ptete (3)	
verbenaceae	*Aloysia Brith*	HUMPOM141	مالويزا	L (41) W (7) C (1)	inf (33) dec (20) po (1)	< 10 (27) 11/20 (12) 21/60 (1)	or (54) inh (1)	drink (1) sugar (1)	(57)	pdig (31) pcard (5) psn (5)	Ziyyat et al., 1997.
	Lippia citriodora L.	HUMPOM142	لويزة	L (107) W (20) S (2)	dec (88) inf (64) po (3)	< 10 (69) 11/20 (22) 1H (2)	or (143) inh (3) ex (3)	honey (6) drink (1) sugar (1)	(159)	pdig (54) psn (21) pcard (11)	Bellakhdar et al., 1991; Jouad et al., 2001; Tahraoui et al., 2006.
viticeae	*Vitis vinifera* L	HUMPOM143	الدالية	L (10) F (4)	dec (4) inf (2) mac (2)	11/20 (3) 21/60 (3)	ex (7) or (6)	flower water (1)	(14)	Ptete (4) alrg (3) pcard (1)	
Zingibéraceae	*Zingeber officinal* rose.	HUMPOM144	سكينجبير	R (31) C (3) S (1)	po (20) dec (10) inf (2)	< 10 (9) 1H (1) 1J-N (1)	or (34) ex (2)	drink (13) honey (5) eggs (1)	(37)	presp (16) pdig (8) pfroi (5)	Bellakhdar et al., 1991; Jouad et al., 2001.
	Alpinia officinarum Hance.	HUMPOM145	الخدنجال	C (2) ST (2) W (1)	dec (3) po (3) inf (1)	21/60 (2) < 10 (2) 11/20 (1)	or (7)	food (2) drink (1)	(7)	presp (3) pdig (1) pfroi (1)	Bellakhdar et al., 1991.
	Elettaria cardamomum White & Maton	HUMPOM146	قاع قلا	S (2)	inf (1) po (1)		or (2)	honey (1)	(2)	pdig (1)	Bellakhdar et al., 1991.
Zygophyllaceae	*Peganum harmala* L.	HUMPOM147	الحرمل	S (25) W (4) R (4)	dec (15) po (11) inf (7)	< 10 (7) 21/60 (4) 11/20 (2)	or (17) ex (13) inh (6)	honey (3) food (1) alum (1)	(36)	pdermo (8) pdig (8) Pmusq (5)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001.
	Zygophyllum gaetulum Emb.& Maire	HUMPOM148	العكاية	L (3) W (2) C (1)	po (5) dec (2) inf (2)	11/20 (1) 1J-N (1) < 10 (1)	or (8) ex (1)		(9)	dia (4) pdig (2) pali (1)	Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001.

effective, natural, does not contain chemical substances and does not have side effects and 18.3% (197 participants) like the plants for their taste and they have confidence on the traditions. Almost 9.1% (98 participants) stated the grasses are less expensive than modern medicine and 2.6% (28 participants) only which mentioned that they are available. Although people are accustomed to using the plants, 4.6% (50 participants) are not completely satisfied because phytotherapy is toxic, is not effective and is not standardized.

Table 4
Most numerously represented families.

Families	Number of taxa
Lamiaceae	17
Asteraceae/Compositae	14
Apiaceeae	12
Fabaceae/Leguminoseae	9
Poaceae/Graminaceae	6
Rosaceae	5
Rutaceae	5

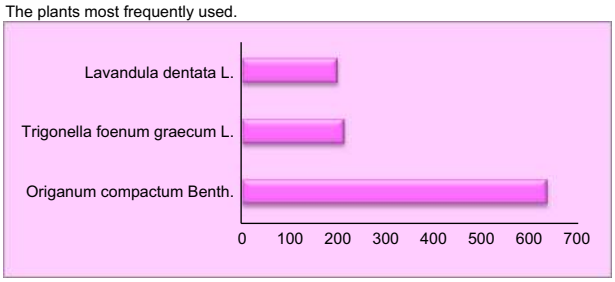

Fig. 3. The plants most frequently used.

3.6. Inventory, source(s), and use of medicinal plants

2029 individuals had used the plants to treat several diseases. The inventory of the plants (in our statistical calculations we have taken into account only the frequency of the species cited more than twice) is summarized in a synoptic table, which contains the scientific and vernacular names of the plant, the part of the plant and the preparation used, the therapeutic indication and the frequency (number of informants). A total of 148 medicinal plants belonging to 60 plant families were identified (Table 3).

Usually, the populations use the aerial parts: the leaves, the flowers, the cortex, the roots, the fruit, the seeds, the bulb, the stem and the extracted oils. The plants or their parts are prepared in the form of material decocted, macerated, infused, burned, in the form of powder, either directly fresh in the form of juice or crushed plants. The administration of the remedies is done orally, by inhalation of decoct, inhalation of the burned plant or external local application. Often, people use a mixture of plants for their disease (80%). Grandparents, parents, neighbors or friends teach the art/science of folk medicine. The number of plants used by only one person reaches an incredible value, for example more than 50 plants with a percentage of 8.8%. The local pharmacopeia is composed not only of the medicinal plants but also of materials derived from the ores and animals such as honey, eggs, musk, alum, salt, food, etc. (Table 3). The population is satisfied with the treatment and use of phytotherapy since 87% and 95.2% of the remedies mentioned, respectively, are effective and not poisonous.

Lamiaceae was the family with the the greatest number (17 plants) of medicinal uses, followed by species Astéraceae (14 plants), Apiacées (12 plants), Fabaceae (9 plants), Poaceae (6 plants) (Table 4), Rosaceae (5 plants) and Rutaceae (5 plants). These seven families constitute 54.1%, and the remainder species belonged to 53 families, each one represented by one to four plants (Table 3).

The plants most frequently used (more than 100 reported) with the fine therapeutic ones are in the decreasing order (Fig. 3): *Origanum compactum* Benth. (633), *Trigonella foenum graecum* L. (212), *Lavandula dentata* L. (198), *Mentha pulegium* L. (181), *Nigella sativa* L. (173), *Rosmarinus officinalis* L. (166), *Lippia citriodora* L. (159), *Tetraclinis articulata* Benth. (158), *Atemisia herba-alba* Asso. (157).

148 plants were used for curing a total of 23 diseases (Table 3). The principal diseases which are treated using the plants include digestive system disorders (108 plants), diabetes (74 plants), dermatological problems (73 plants), allergy (66 plants), cardiovascular disorders (66 plants), respiratory problems (63 plants), problems of the bones and articulations (59 plants), and renal pathologies (59 plants). It was also found that one plant might be used for curing several ailments, for example *Origanum compactum* Benth, a creeper, is used to treat problems of the digestive system, diabetes, influenza and cold (Table 3; Table 5).

Plants most frequently used according to the type of pathology in the decreasing order:

- to deal with digestive problems: *Origanum compactum* Benth. (236), *Rosmarinus officinalis* L. (75), *Lavandula dentata* L. (73), *Nigella sativa* L. (70), *Trigonella foenum graecum* L. (66), *Tetraclinis articulata* Benth. (60), *Lippia citriodora* L. (54), *Atemisia herba-alba* Asso. (53), *Punica granatum* L. (50).
- to treat diabetes: *Trigonella foenum graecum* L. (54), *Rosmarinus officinalis* L. (48), *Artemisia herba-alba* Asso. (30), *Nigella sativa* L. (13), *Salvia officinalis* (13), *Mentha pulegium* L. (11), *Citrullus colocynthis* L. (13).
- for cardiovascular disorders: *Origanum compactum* Benth. (35), *Allium satium* L. (19), *Trigonella foenum graecum* L. (14), *Nigella sativa* L. (13), *Lippia citriodora* L. (11), *Atemisia herba-alba* Asso. (10).
- to deal with respiratory problems: *Origanum compactum* Benth. (48), *Mentha pulegium* L. (22), *Nigella sativa* L. (17), *Trigonella foenum graecum* L. (17), *Zingeber officinal* rose. (16), *Atemisia herba-alba* Asso. (14), *Ptychotis verticillata* L. (11), *Tetraclinis articulata* Benth. (11), *Olea europaea* L. (10), *satureja calamintha* L. (10).

Several plants, generally employed in the area of Oriental Morocco, are generally used throughout the whole country (Bellakhdar et al., 1991; Ziyyat et al., 1997; Jouad et al., 2001; Eddouks et al., 2002; El-Hilaly et al., 2003).

3.7. Informant consensus factor and use value

The results of the informant consensus factor (ICF) (Table 5) calculation show that the value in our study ranges from 0.22 to 0.92. Gastro-intestinal ailments have high ICF value of 0.92, with 1384 use-reports for 108 plant species. It is followed by influenza, cold ICF: 0.83, pathologies of the respiratory system ICF: 0.81, diabetes ICF: 0.78, and cardiovascular and dermal problems ICF: 0.74. The high ICF for these problems shows that this ailment is common in the study area due to poor sanitation in the region and a better communication is established between informants for treating this ailment category. The least agreement between the informants was observed for plants used in vision problems and the eye ICF: 0.22, pathologies of the circulatory system ICF: 0.24 and cholesterol ICF: 0.33. The low ICF value seen in our study for these problems could be due to a lack of communication among people in different areas of the multicultural study region.

Table 5
The list of diseases and their symptoms, ICF and the three plants most frequently used.

Codes of ailments	Ailments	Symptom	Use citation	Number of plants used	ICF value	Codes of the plants most frequently used
pdig	Pathologies of the digestive system	Diarrhea – dysentery – gastritis – indigestion – intestinal ulcer – laxative – stomach ache – vomiting – worms/antihelmentic – liver problems – bile problems	1384	108	0.92	*Origanum compactum* Benth., *Rosmarinus officinalis* L., *Lavandula dentata* L.
pfroi	Cold problems	Cold – cough – influenza.	221	39	0.83	*Origanum compactum* Benth., *Mentha pulegium* L., *Ptychotis verticillata* L.
presp	Pathologies of the respiratory system	Asthma – bronchitis – chest pain – lungs disorder	329	63	0.81	*Origanum compactum* Benth., *Mentha pulegium* L., *Nigella sativa* L.
dia	Diabetes	Diabetes I and II	334	74	0.78	*Trigonella foenum graecum* L., *Origanum compactum* Benth., *Atemisia herba-alba* Asso.
pcard	Cardiovascular diseases	Hyertention, heart nod	252	66	0.74	*Origanum compactum* Benth., *Allium satium* L., *Trigonella foenum graecum* L.
pdermo	Dermocosmotology,	Boils – burns – pimples – scabies – skin cracks - skin diseases – sun burn/tanning – warts musa – hair problem beauty care and capillary, hair care	276	73	0.74	*Lawsonia inermis* L., *Origanum compactum Benth., Olea europaea* L.
alrg	Allergy	Hypersensibility	218	66	0.70	*Origanum compactum* Benth., *Nigella sativa* L., *Tetraclinis articulata* Benth.
Pmusq	Skeleton–muscular system problems	Body pain – external injury – fracture/broken bones – inflammation – internal injury – joint pain – rheumatism – sprain – rheumatism, slipped disc, foot, break, sciatic nerve,…	184	59	0.68	*Origanum compactum* Benth., *Nigella sativa* L., *Tetraclinis articulata* Benth.
prep	Pathologies of the reproductive system	Aphrodisiac – fertility – problem menstrual disorder,…	69	23	0.68	*Lavandula dentata* L., *Rosmarinus officinalis* L., *Origanum compactum* Benth.
psn	Problems of the nervous system	Insomnia – jaundice	135	46	0.66	*Lippia citriodora* L., *Rosmarinus officinalis* L., *Nigella sativa* L.
Pren	Pathologies of the urinary system	Kidney problems – diuretic	160	59	0.64	*Hernaria hirsuta* L, *Origanum compactum* Benth., *Zizyphus lotus* (L.)
Ptete	Head problems	Headaches, migraine…	144	54	0.63	*Chenopodium ambrosioides* L, *Lawsonia inermis* L., *Eugenia caryophyllata* thumb.
Pmicro	Microbial infection	Measles – ictère – syphilis	51	22	0.58	*Phillyrea angustifolia* L., *Chenopodium ambrosioides* L, *Borago officinalis* L.
cancer	Cancer	Of the lung – the uterus – the center – the skin – blood	27	13	0.54	*Berberis hispanica* Boiss.et Reut., *Aristolochia longa* L., *Nigella sativa* L
Porl	Problems of hearing and the ear	Problems of ear ache/ear problems – sinusitis	43	21	0.52	*Citrus limum* Riss., *Olea europaea* L., *Artemisia absinctium* L.
pden	Problems of the sphere buccodentaire	Gum diseases – tooth decay – toothache – sore throat – tonsil	38	19	0.51	*Eugenia caryophyllata* thumb., *Origanum compactum* Benth., *Juglans regia* L.
intox	Antidote	Food poisonings – intoxication by venoms of scorpions and snakes	9	5	0.50	*Haloxylon scoparium* Pomp., *Anabasis aretioides* coss, et Dur, *Artemisia absinctium* L.
pali	Power problems	Appetizer – tonic/weakness – restoration of vitality – obesity – weakness – general tiredness	59	30	0.50	*Trigonella foenum graecum* L., *Origanum compactum* Benth., *Viscum album* L.
fiev	Fever	Fever	36	19	0.49	*Chenopodium ambrosioides* L, *Ptychotis verticillata* L., *Allium sepa* L
chol	Cholesterol	Cholesterol	22	15	0.33	*Allium satium* L., *Origanum compactum* Benth., *Nigella sativa* L.
pcir	Pathologies of the circulatory system	Blood disorder/blood purification – lymph disorder	39	30	0.24	*Allium satium* L., *Citrullus colocynthis* L., *Ficus carica* L.
poi	Ophthalmological problems	Conjunctivitis – eye diseases	10	8	0.22	*Allium sepa* L., *Lippia citriodora* L., *Matricaria chamomilla* L.
autre	Others	Lactation – goiter – cyst – thyroid – rétention du sodium	8	7	0.14	

4. Conclusion

This study proved that folk medicine is still widely practiced by the population in Oriental Morocco. This region, which is rich in medicinal plants, still needs more exploration and study. Thus, it is important to document and reconstitute the remainders of the ancient medical practices which exist in Morocco and other areas of the world, and preserve this knowledge for future generations. The traditional medicine used in the region lacks phyto-therapeutic evidence. It is necessary to perform phytochemical or pharmacological studies to explore the potential of plants used for medicinal purposes. The unsustainable harvesting of such medicinal plants that are obtained from the wild may cause a serious decline in plant population. It is thus recommended that cultivation techniques be formulated, especially for the most important plant species that are used widely and traded outside the region.

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